

Simulated Effect of Timber Harvest on Habitat Suitability of Indiana and Northern Long- eared Bats

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BAT CONSERVATION



- **Critical period**
 - Bats serve important ecological role
 - Historical threats to bats
 - Emergence of White Nose Syndrome (WNS)
 - Need for multifaceted approach to conservation

BALANCING USE OF PUBLIC LANDS

- **Indiana State Forests**
 - >150,000 acres
 - Ecological forestry
 - Forest management (oak regeneration)
 - Timber harvest sales
 - Wildlife conservation
- **Are current practices optimal?**



Photo © Indiana Department of Natural Resources

INDIANA BAT



Photo: U.S. Fish & Wildlife Endangered Species website
Adam Mann, Environmental Solutions and Innovations

- Federally endangered
- Historic threats
 - Hibernacula disturbance
 - Habitat loss and fragmentation
- Under threat of WNS
- (*Myotis sodalis*)
[MYSO]

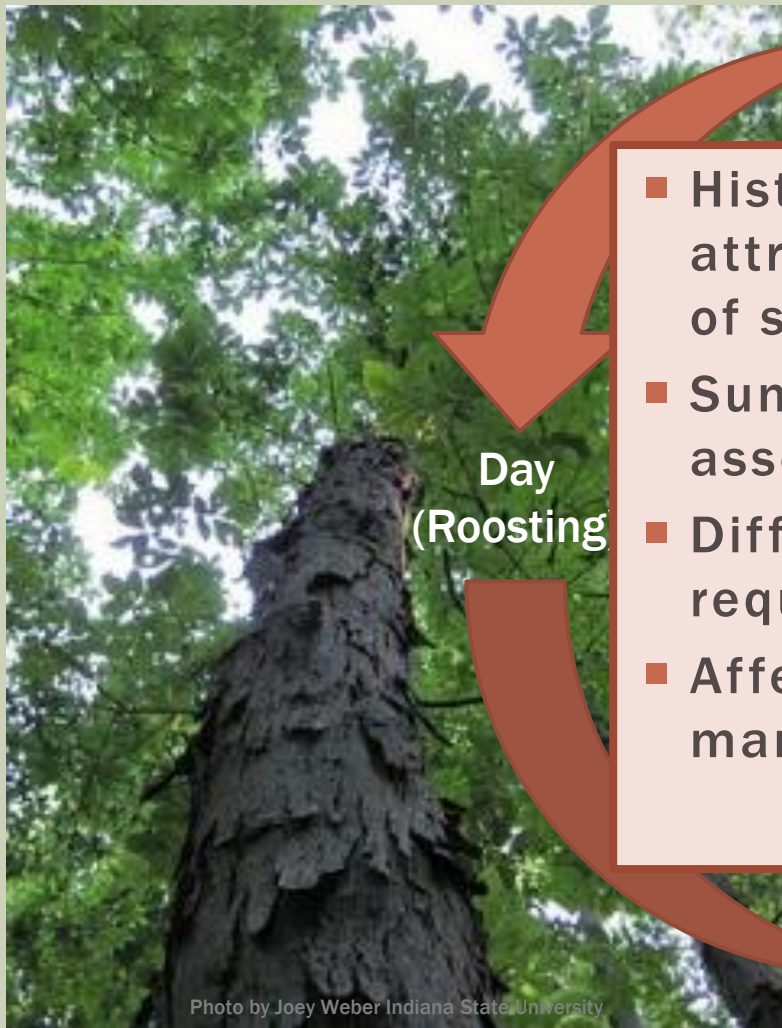
NORTHERN LONG-EARED BAT

- Northern long-eared (*Myotis septentrionalis*) [MYSE]
- Historically common
- Under severe threat of WNS
- Likely to be federally listed species
- First species to become endangered from WNS



Credit: painting by Wendy Smith from Kays and Wilson's *Mammals of North America*, © Princeton University Press (2002)

SUMMER HABITAT REQUIREMENTS



Day
(Roosting)

- Historic declines attributed to loss of summer habitat
- Summer forest associated
- Different requirements
- Affected by forest management



Night
Foraging)

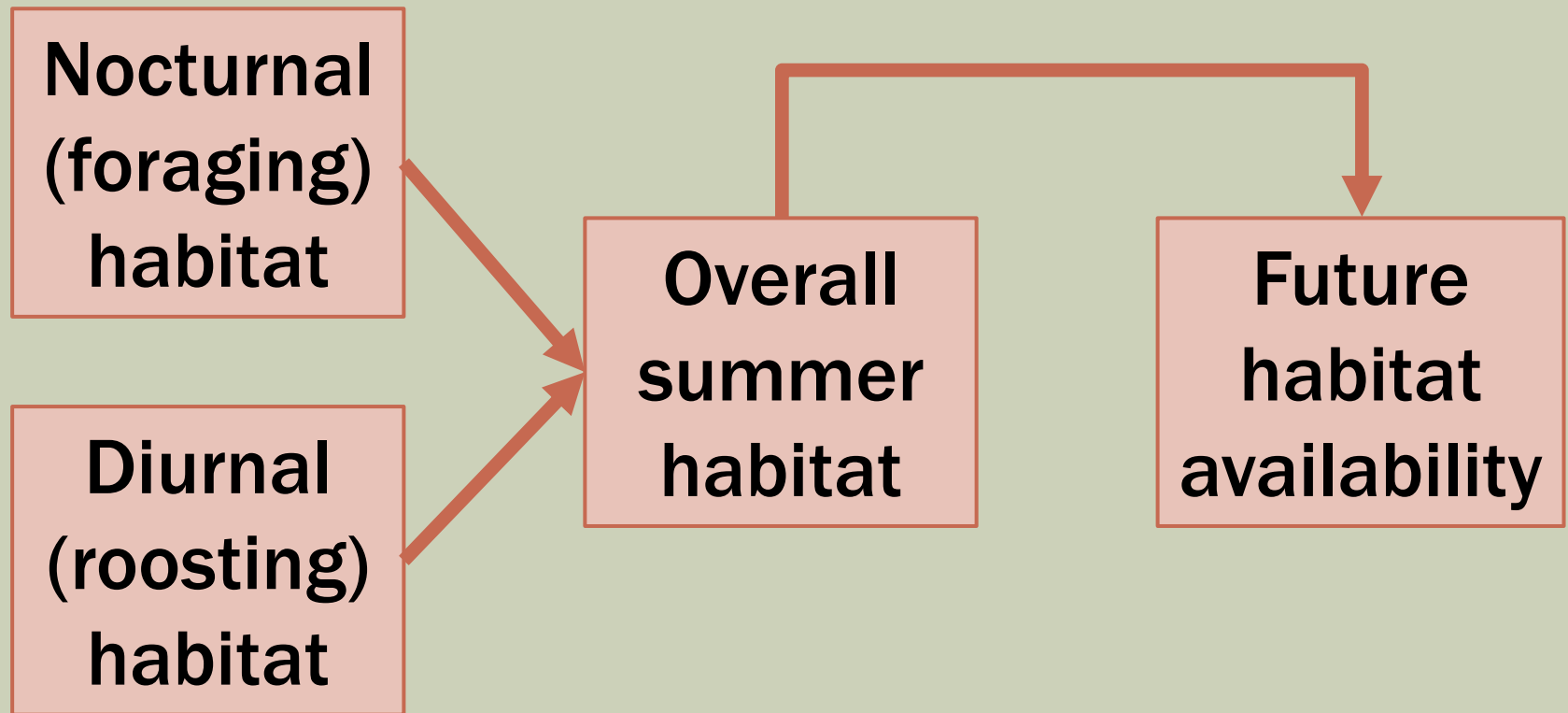
LANDSCAPE-LEVEL MANAGEMENT



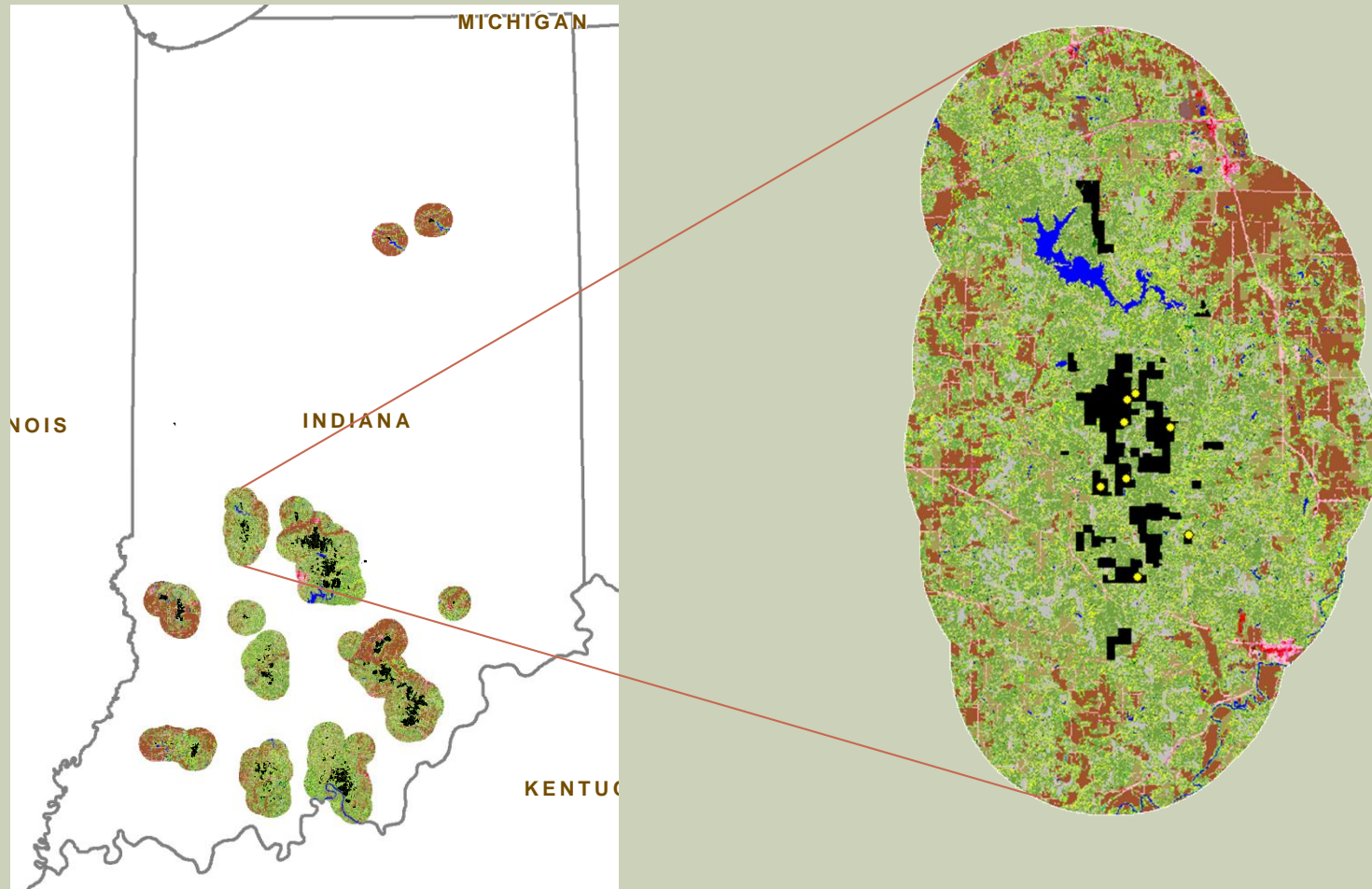
Photo: U.S. Forest Service Region 9 website



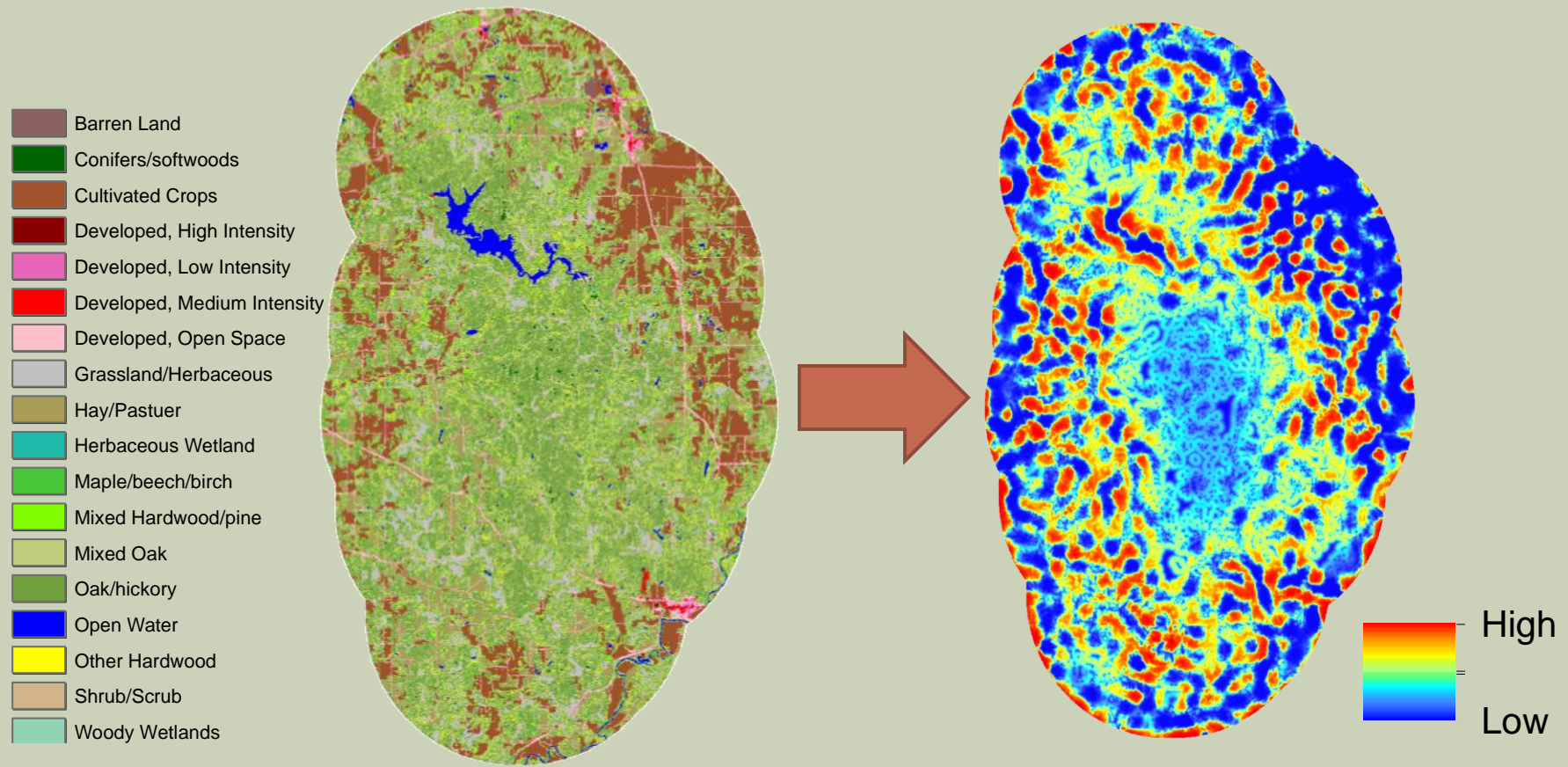
APPROACH



STUDY AREAS

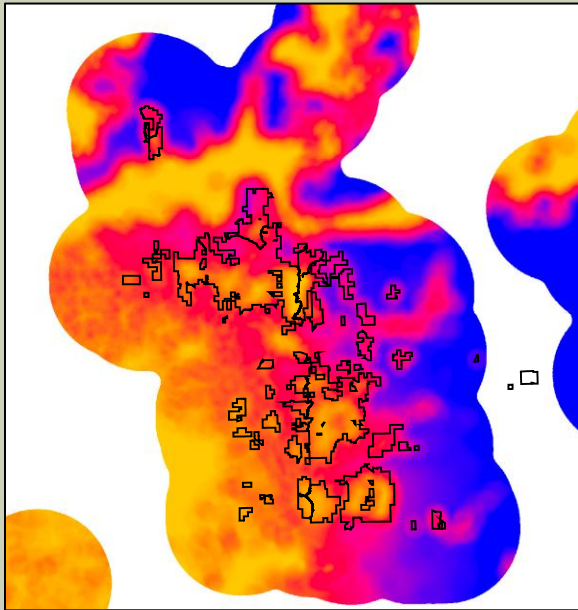


NOCTURNAL OCCUPANCY MAPPING

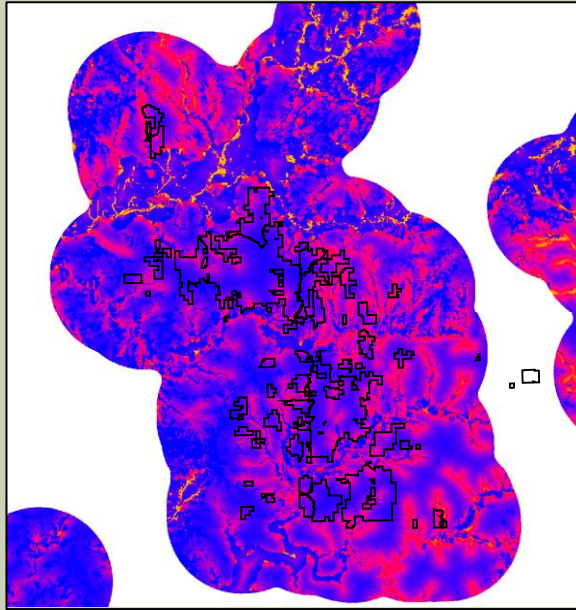


COMBINING OCCUPANCY MAPS

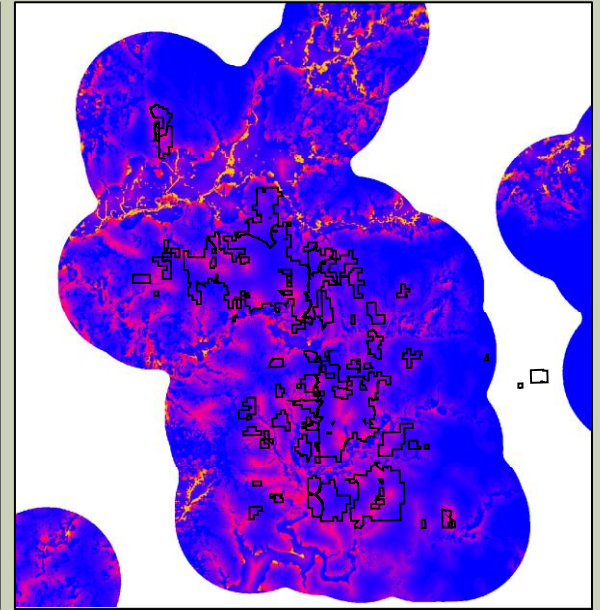
Nocturnal



Diurnal



Combined



HOW TO INFORM MANAGEMENT?



UC Santa Barbara Department of Geography

- Identify critical/high quality areas
- Protect valuable areas
- Institute management that produces quality habitat
- Provide balance between conservation and resource use
- Timber management

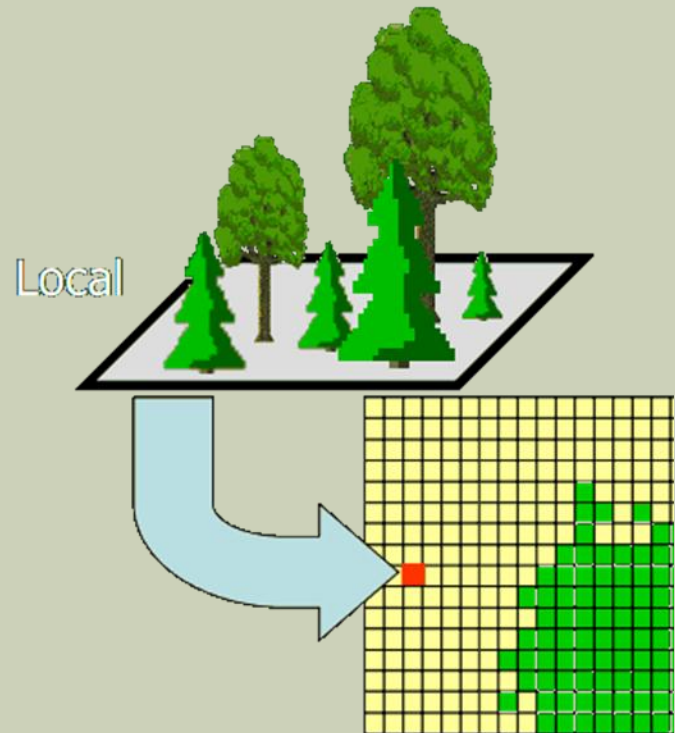
TIMBER HARVESTING



- Currently heavily selective harvests
- Exploring other approaches (regenerative cuts, more intense, etc.)
- 9 harvest scenarios
 - 1: No harvest
 - 2: Historical harvests
 - 3: Current harvests
 - 4: Strongly selective
 - 5: Moderately selective
 - 6: Moderately regenerative
 - 7: Strongly regenerative
 - 8: Intensive harvest
 - 9: Maximum harvest

LANDIS-II SIMULATIONS

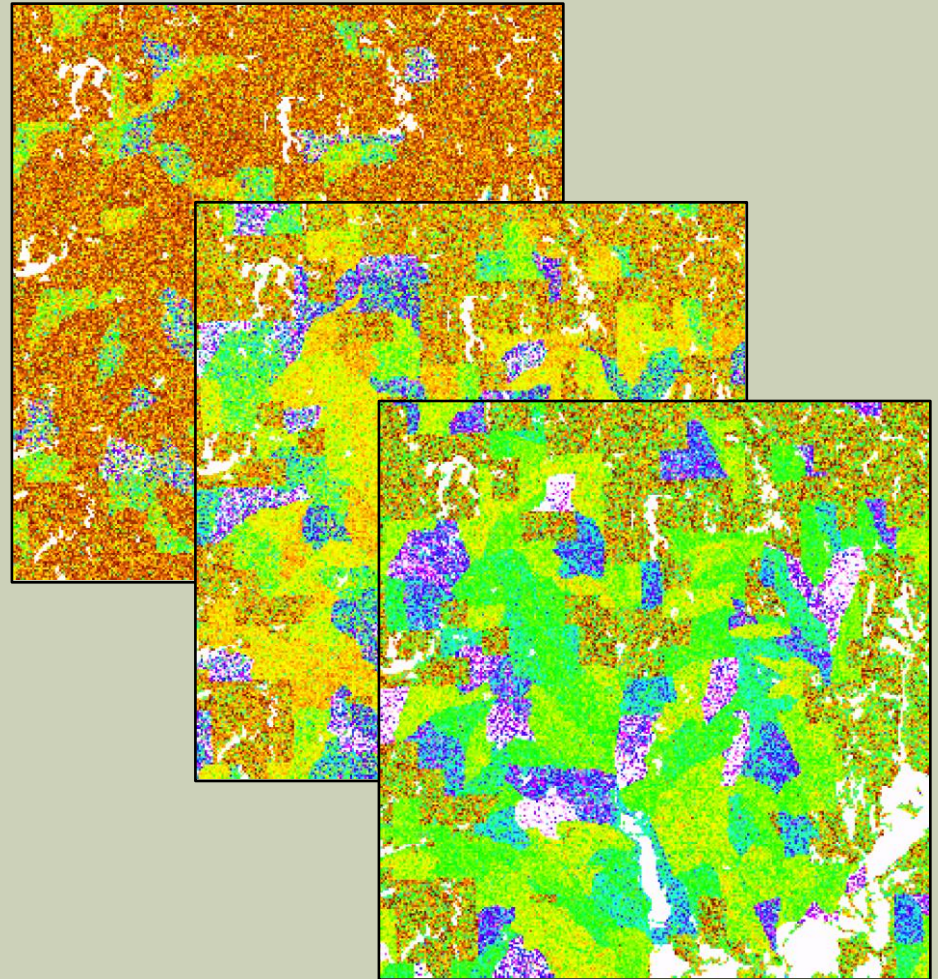
- Forest successional modeling
 - Simulate tree competition
 - Growth
 - Shading
 - Seed dispersal
 - Mortality
- Timber harvest
 - Single tree selection
 - Patch cuts
 - Shelterwood
 - Clearcuts
- Apply bat habitat models to output



Brian Miranda, USFS

COMPARING SCENARIOS

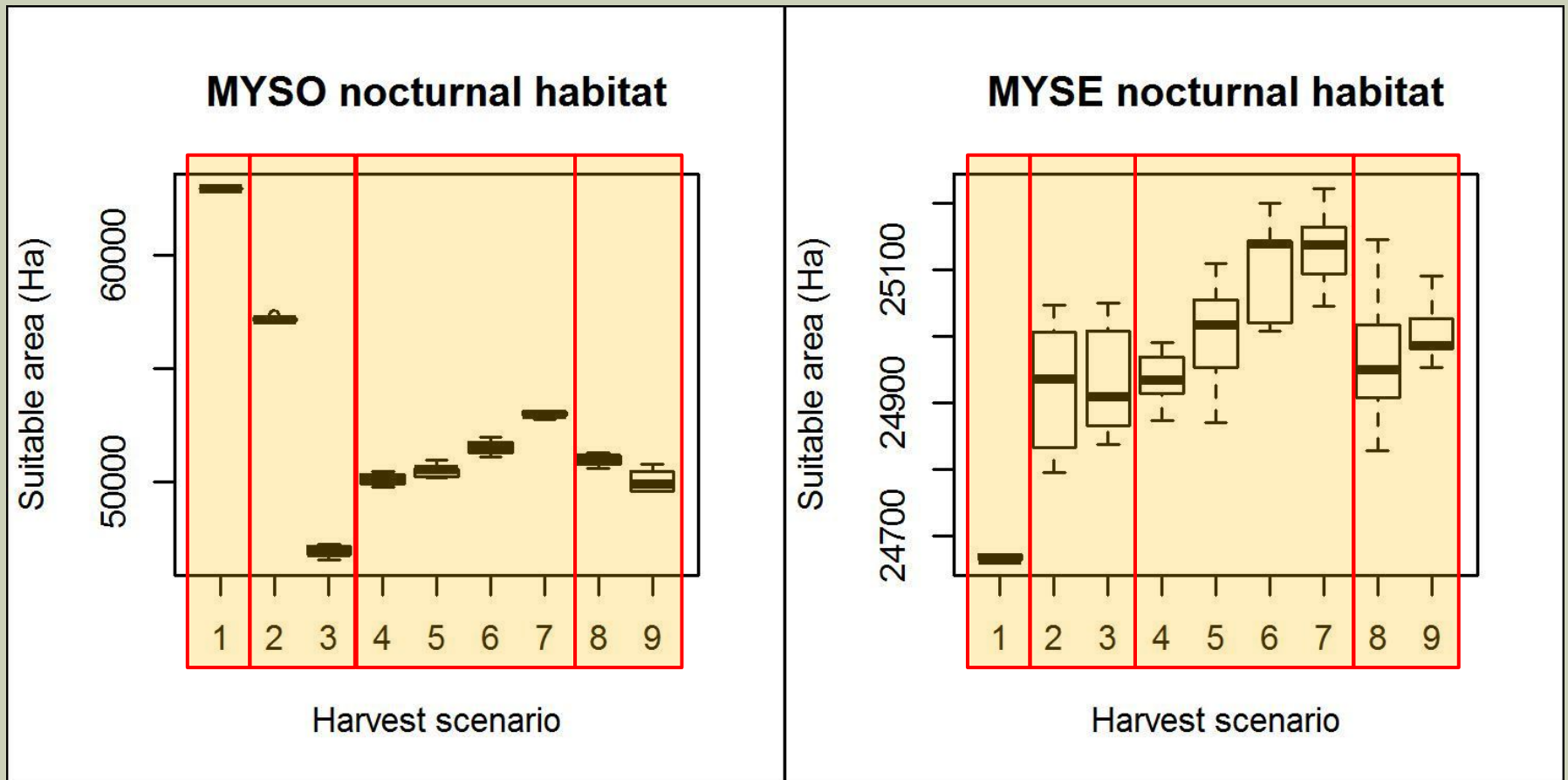
- 891 simulations
 - Each state forest property
 - 9 scenarios
 - 3 initial conditions
 - 3 replicates (harvest order randomized)
- Compared suitable habitat under scenarios



NOCTURNAL HABITAT

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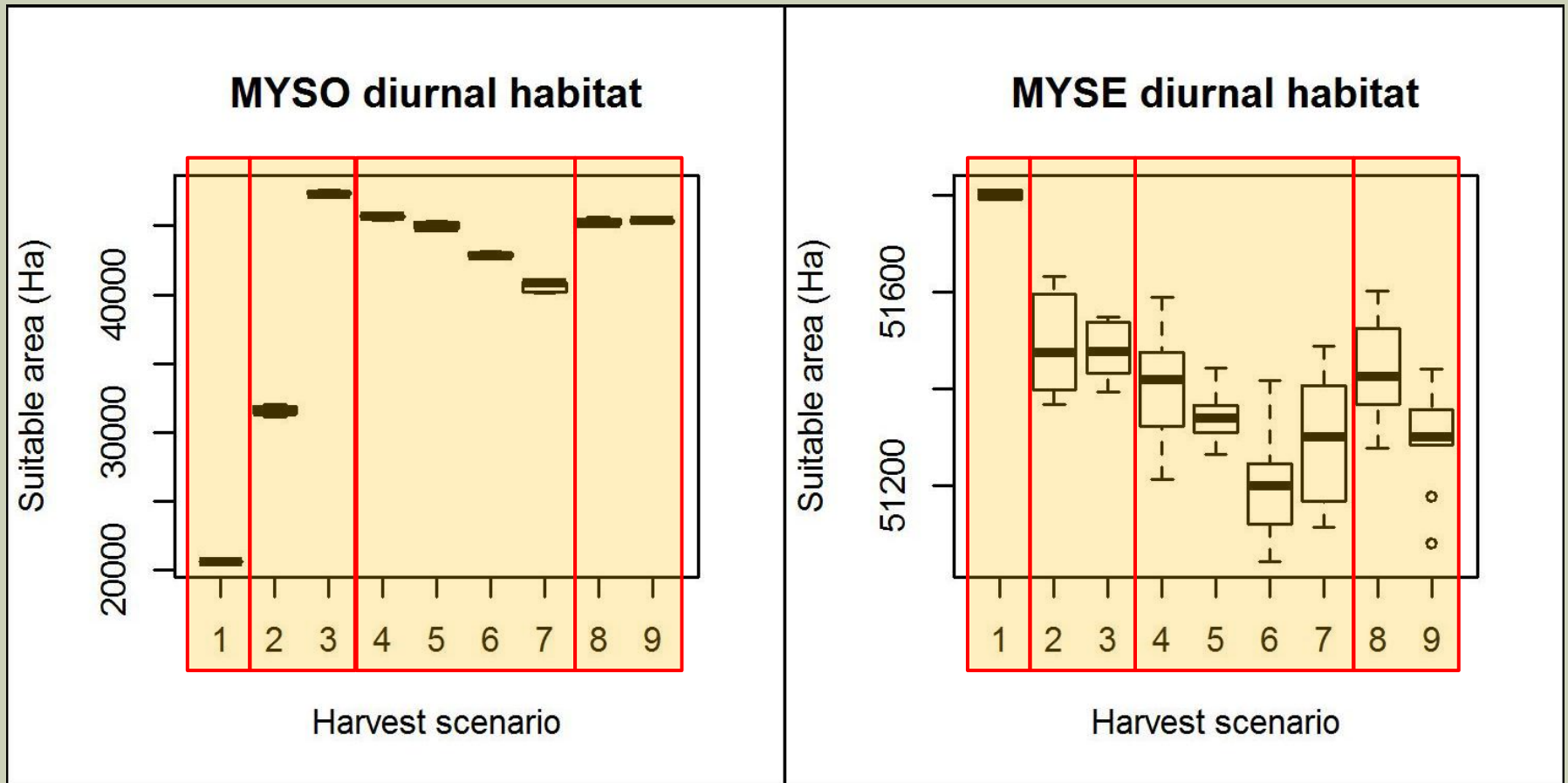
Historical long-eared bat harvests



DIURNAL HABITAT

- 1: No harvest
- 2: Historical harvests
- 3: Current harvests
- 4: Strongly selective
- 5: Moderately selective
- 6: Moderately regenerative
- 7: Strongly regenerative
- 8: Intensive harvest
- 9: Maximum harvest

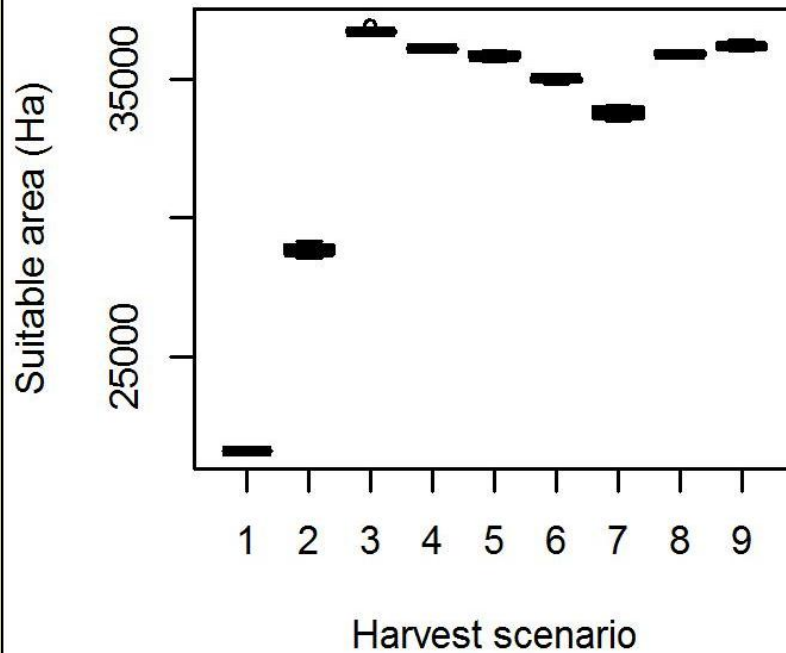
Historical long-eared bat harvests



OVERALL HABITAT

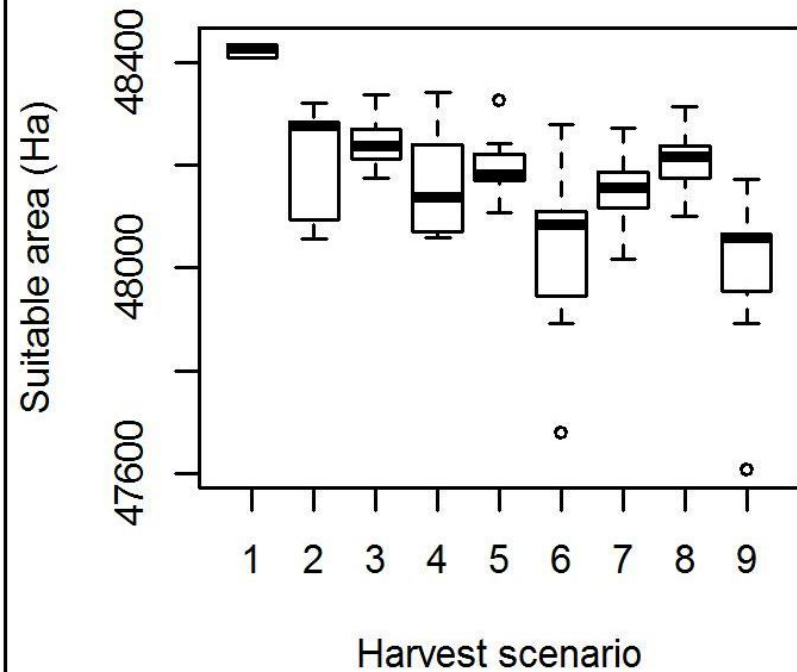
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MYSO combined habitat



Indiana bat

MYSE combined habitat



Northern long-eared bat

CONCLUSIONS

Timber harvest

- Extreme scenarios had opposing effects on MYSO and MYSE
- Regeneration openings improved nocturnal habitat
- Selective harvests favored roosting habitat
- Both species able to withstand forest management (MYSO more sensitive)
- Potential win-win scenarios

Approach

- Separated habitat needs temporally via sampling method
- Combined for overall habitat suitability
- Identified hotspots
- Projected future forests
- Predicted suitability from management
- Informed timber management in Indiana
- Multispecies conservation with complex habitat needs

OUTLOOK

- Directly inform conservation of important habitat
- Will aid in approaches to timber harvest
- Incorporate into HCP
- Integrate with other needs of state forests
- Coupling of harvests to create optimal habitat



Photo by Andrew King, USFWS

ACKNOWLEDGEMENTS

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